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Scaffolding

Construction Safety

By Dave Stanton

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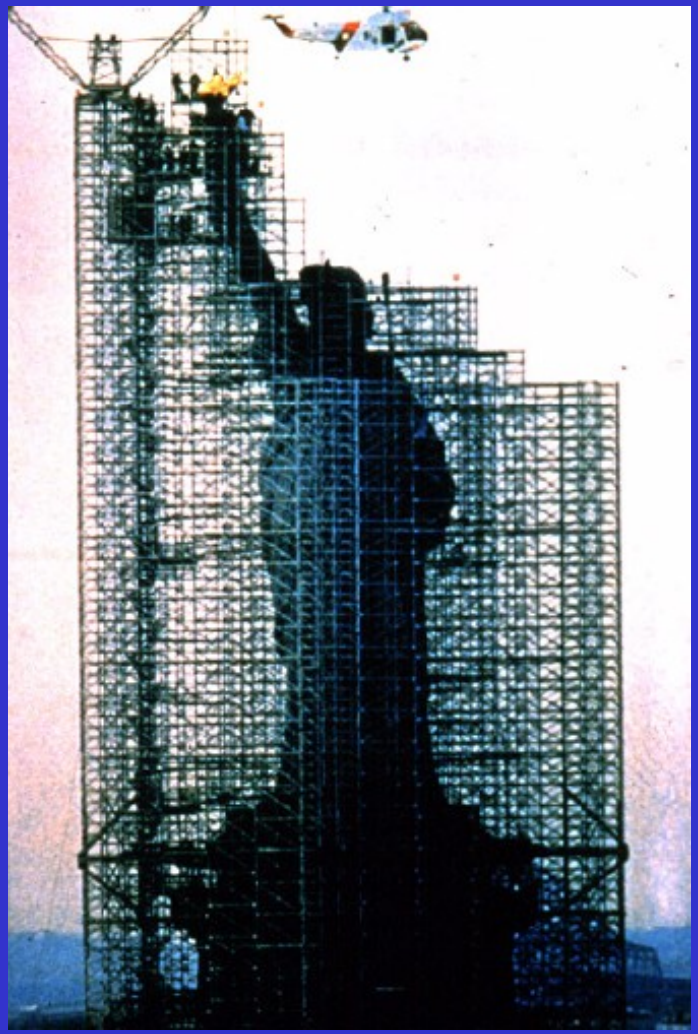
Scaffolds



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Fall Protection, Scaffolding, and Access

- EM 385-1-1
- Sections 21 & 22

- ANSI Standards
- DIN 4420 Part 1-4

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Cardinal Principles of Scaffolding and Access

- Safe access shall be provided to all work areas
- Erection, moving, dismantling or altering shall be under the supervision of a competent person responsible for job safety
- Scaffolding shall not be erected near power lines

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What Is A Scaffold?

An elevated, temporary work platform

Three basic types:

- **Supported scaffolds** -- platforms supported by rigid, load bearing members, such as poles, legs, frames, & outriggers
- **Suspended scaffolds** -- platforms suspended by ropes or other non-rigid, overhead support

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Hazards

Employees working on scaffolds are exposed to these hazards:

- **Falls from elevation** – caused by slipping, unsafe access, and the lack of fall protection
- **Struck by** falling tools / debris
- **Electrocution** – from overhead power lines
- **Scaffold collapse** - caused by instability or overloading
- **Bad planking** giving way

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Fall Hazards

Falls may occur:

- While climbing on or off the scaffold
- Working on unguarded scaffold platforms
- When scaffold platforms or planks fail

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Protecting Workers from Falls

If a worker on a scaffold can fall more than 1.8 meters, protect them with scaffolding

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Guardrails

- Install along open sides & ends
- Front edge of platforms not more than 14 in. (35 cm) from the face of the building
- Top rails – 42 in. +/- 3 in. (107cm) tall
- Midrails halfway between top rail and platform
- Toe boards at least 4 in. (10 cm) high

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Falling Object Protection

- Wear hardhats
- Barricade area below scaffold to forbid entry into that area
- Use panels or screens if material is stacked higher than the toe board
- Build a canopy or erect a net below the scaffold that will contain or deflect falling objects

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Overhead Power Lines

The possibility of electrocution is a serious considerati when working near overhead power lin

Check the clearance distances listed in t standard

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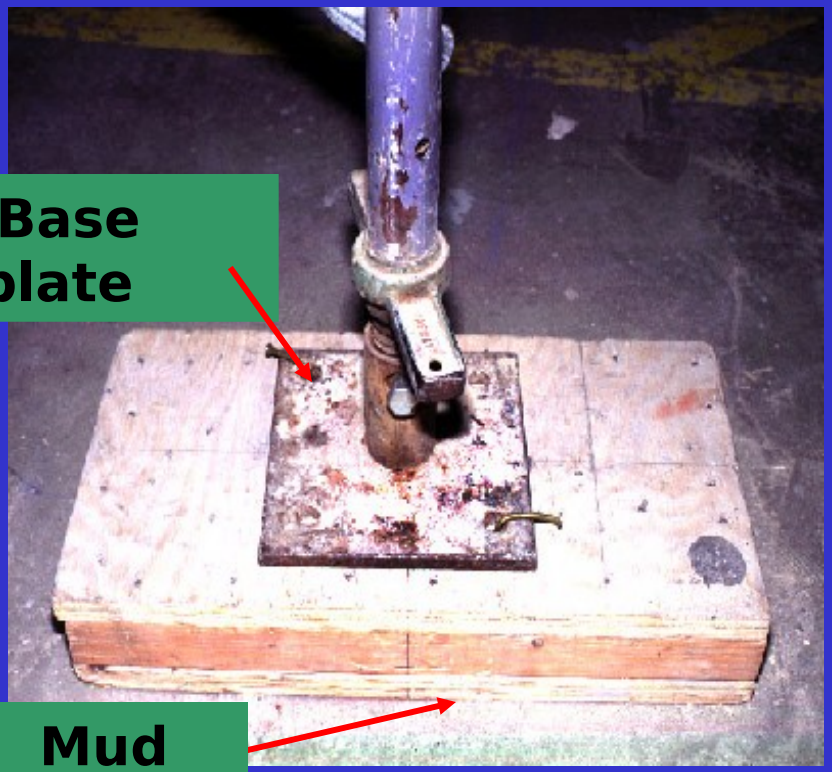
Scaffold Support Examples



Good support

Inadequate support –
in danger of collapse?

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Essential Elements of Safe Scaffold Construction

- Use appropriate scaffold construction methods
- Proper scaffold access
- Properly use a competent person

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Scaffold Platform Construction

Platforms must:

- **be fully planked or decked with no more than 2.5 cm (1”) gaps**
- **be able to support its weight & 4 times maximum load**
- **be at least 45 cm (18”) wide**

This is not a properly constructed scaffold

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Scaffold Platform Construction

- No large gaps in front edge of platforms
- Each abutted end of plank must rest on a separate support surface
- Overlap platforms at least 30 cm (12”) over supports unless restrained to prevent movement

Planks not properly overlapped

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Scaffold Platform Construction

- No paint on wood platforms
- Use scaffold grade wood
- Fully planked between front upright and guardrail support
- Component pieces used must match and be of the same type
- Erect on stable and level ground
- Lock wheels and braces

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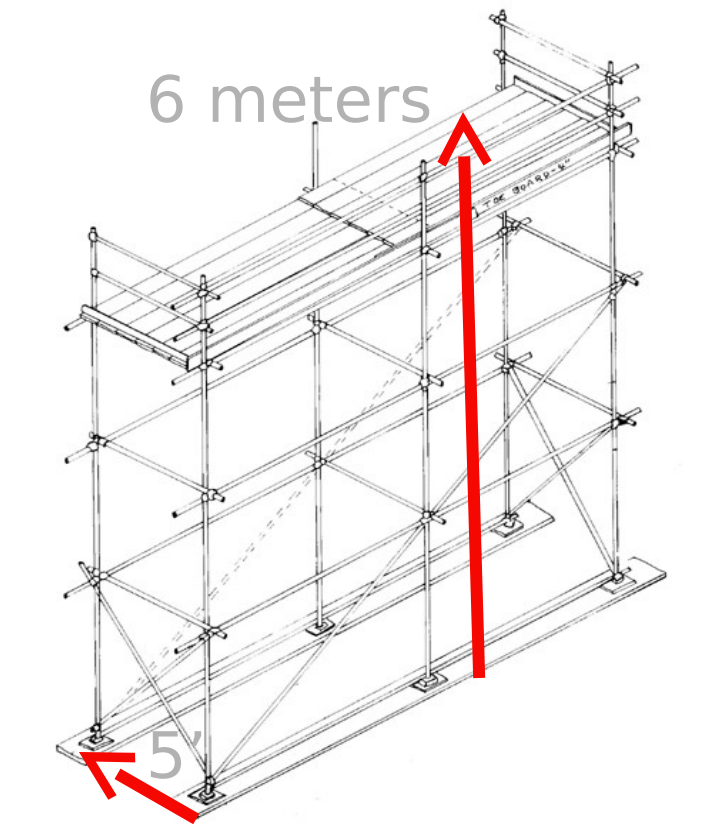
Scaffold Height



The height of the scaffold should not be more than four times its minimum base dimension unless guys, ties, or braces are used

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Platform Ends

Each end of a platform, unless cleated or otherwise restrained by hooks, must extend over its support by at least 15 cm

Supported Scaffolds

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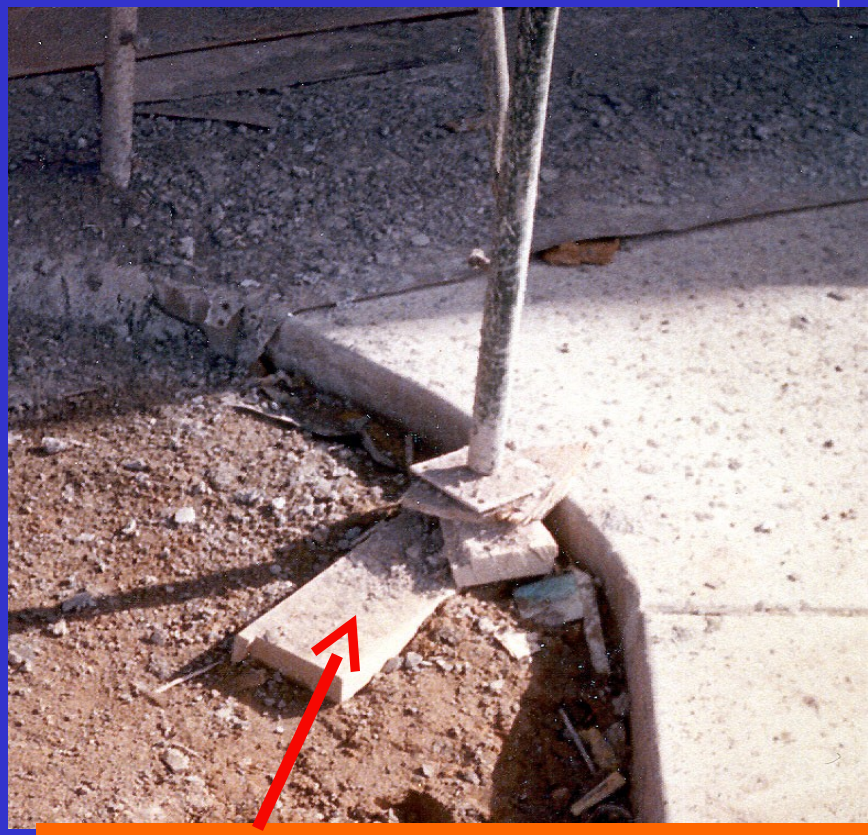
Platforms supported by legs, outrigger beams, brackets, poles, uprights, posts, & frames

Restrain from tipping by guys, ties, or braces

Scaffold poles, legs, posts, frames, and uprights must be on base plates and mud sills or other firm foundation



This support is not adequate!

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Proper Scaffold Access

Provide access when scaffold platforms are more than 60 cm (2’) above or below a point of access

Permitted types of access:

- **Ladders, such as portable, hook-on, attachable, stairway type, and built-ins**
- **Stair towers**
- **Ramps and walkways**

May use building stairs and come out window

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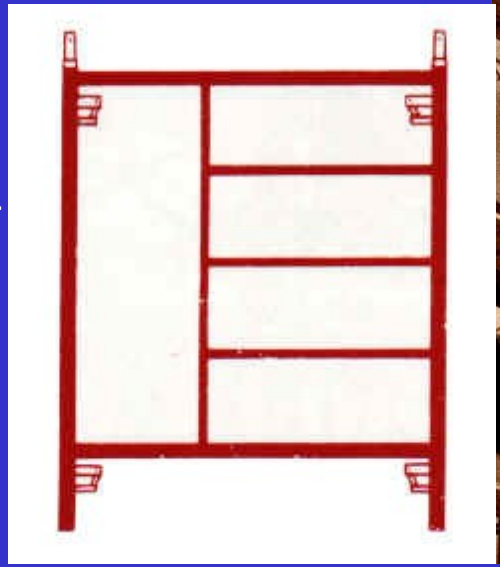
Scaffold Access

- No access by crossbraces
- When using ladders, bottom rung no more than 60 cm (24”) high
- Can use some end frames
- Can access from another scaffold, structure or hoist



End Frame

Do not access by crossbraces

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Moving Scaffolds

Employees can’t be on a moving scaffold

Employees can’t be on scaffold part beyond the wheels

Competent person must be on site to supervise

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Don’t use Shore or Lean-to Scaffolds

Shore scaffold supported scaffold which is placed against a building or structure and held in place with props

Lean-to scaffold supported scaffold which is kept erect by tilting it toward and resting it against a building or structure

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Using Scaffolds

- **Don’t work on snow or ice covered platforms or during storms or high winds**
- **Use tag lines on swinging loads**
- **Protect suspension ropes from heat & acid**

A covered scaffold has special wind load considerations

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Competent Person

Person capable of identifying and promptly correcting hazards

Determines if it's safe to work on a scaffold during storms or high winds

Trains workers to recognize hazards

Selects qualified workers to conduct work

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Scaffold Inspection

Competent person inspects scaffolds for visible defects before each shift and after any alterations

Defective parts must be immediately repaired

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Training Requirements

Train employees on scaffold hazards and procedures to control the hazards

The training must include:
- **Nature of electrical, fall, and falling object hazards**
- **How to deal with electrical hazards and fall protection systems**
- **Proper use of the scaffold**
- **Scaffold load capacities**

Retrain as necessary

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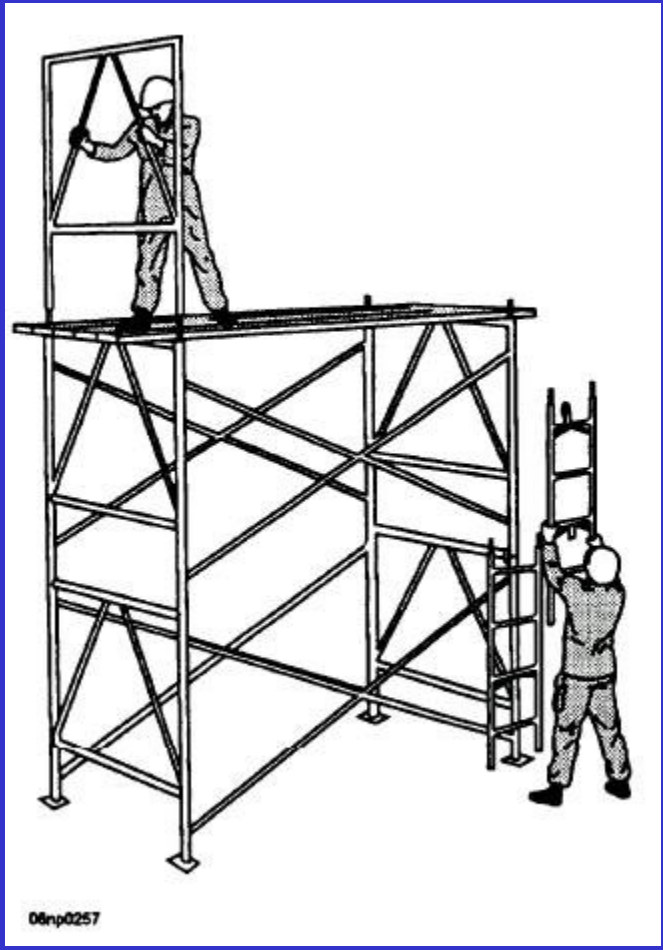
Training Erectors

Train employees involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold to recognize its hazards and the correct procedures to use



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Main Hazards of Scaffolds

- Falls from elevation
- Bad planking
- Scaffold collapse
- Getting struck by falling tools or debris
- Electrocution

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Summary

Remember to:

- Use appropriate scaffold construction methods
  - Erect, move, or alter scaffold properly
  - Protect from falling objects or tools
- Ensure stable access
- Use a competent person
  - Train on scaffold construction and the hazards involved with scaffolds
  - Inspect scaffold before each shift and after alterations
  - Determine fall protection requirements

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Questions?

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Metal Scaffolds and Towers

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Metal Scaffolds and Towers

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Accessways and Ladders - General Requirements

- Where accessways are slippery, abrasive material shall be used to assure safe footing
- Shall be kept free of snow, ice, mud, grease, debris or other material which could obstruct passage, cause a tripping hazard or make them unsafe

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Accessways and Ladders - General Requirements

- Any obstructions/projections shall be removed or marked
- Accessways which become damaged or weakened shall not be used until repaired or replaced

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Fall Protection Basic Principles (Para 21.a.15)

- Employees shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent in the following situations:
  - On accessways (excluding ladders) or platforms where employee can fall 1.8 meters or more.
  - On accessways or platforms over water, machinery, or dangerous operation

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Protecting Stairways and Accessways Opening

- Openings shall be guarded on all exposed sides except the entrance by a standard guardrail

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Personal Fall Protection Devices - Basic Requirement

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Personal Fall Protection Devices - Basic Requirement

- Personal Fall Protection devices (personal fall arrest systems and positioning devices), independently attached shall be used when working and the requirements of paragraph of 22.a.04 cannot be met

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Selection of Personal Fall Protection Equipment Shall be Based On:

- Cannot accomplish work with scaffolding or similar. Requires GDA approval to use.
- Work environment
- Weight, size and shape of user
- Type and position of anchorage

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Personal Fall Arrest Systems (PFAS)

You must be trained how to properly use PFAS

PFAS include anchorage, lifeline and body harness

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Fall Protection Equipment General Requirements

- Manufacturers Recommendations Shall Be Followed in:
  - fitting
  - use
  - inspection
  - testing
  - care/maintenance

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21.A.01 Safe Access will be provide to all work areas

Harness should be used as last resort

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Fall Arrest Systems

- Maximum arresting force of 816 kg (1,800 lbs) on body
- Not let worker free-fall more than 1.8 meters (6’) or contact lower
- Level or physical hazard
- Bring worker to complete stop in 1 meter (3’)
- Have sufficient strength to withstand twice the potential impact energy of a

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Lanyards will limit free fall to 0.6 m (2

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Harnesses

- Shall have two lanyards to assure that workers are tied off at all times by at least one lanyard at all times
- Shall have two lanyards where lanyard is the primary support for operations such as rock scaling or high-wall concrete finishing

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Personal Fall Protection System Inspections

- Each day
- Before each use
- Defective equipment shall be removed from use
- Equipment subjected to impact shall be removed from service

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Anchorages and Equipment

- Anchorages and equipment shall be independent of any anchorage used to support or suspend platforms and be capable of supporting at least 2,268 kg (5,000 lbs) per worker
- Attachment point for harness must be in the center of the wearer's back
- Shall not be attached to hoists
- When used at hoist areas, it shall be rigged to allow the movement of the

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Ladders - General Requirements

- Ladders shall have a smooth surface to prevent lacerations or splinters
- Ladders shall not be coated with opaque coating (paint)
- Step ladders shall have a metal spreader bar/locking device
- Ladders shall not be set up where they are likely to be displaced or knocked over, e.g., doorways, aisleways, etc., unless protected by

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Job Made Ladders – 21.D.01 and Appendix J (7)

Construction of job made wooden ladders shall conform to ANSI A14.4

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Ladder Length Requirements

- Ladders shall be of sufficient length to preclude workers from stretching or assuming a hazardous position
- Ladders shall extend 1 meter past landing or grasping device or grab rail
- Length shall not be such that deflection would cause a ladder to slip and fall from its support

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Ladders - General Requirements (Continued)

- Portable ladders shall be used at a 4:1 setup

- Ladders shall be secured at the top and bottom

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Ladders - General Requirements (Continued)

- No work requiring lifting of heavy materials or substantial exertion shall be done from ladders

- Portable ladders shall have skid-resistant feet

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Ladders - General Requirements (Continued)

- Top steps of step ladders shall not be used as a step
- Ladders shall be inspected daily
- Broken or unsafe ladders shall be removed from service and tagged

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Summary

- Working on/around scaffolds and ladders is very dangerous activity
- Inspect daily or more frequently if need be
- Assure structural members are plumb, level and on solid footing
- Enforce the EM 385-1-1 requirements
- Essayons!!

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